

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 232	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/KR 2004/003287	International filing date (day/month/year) 14 December 2004 (14.12.2004)	Priority Date (day/month/year) 18 February 2004 (18.02.2004)
International Patent Classification (IPC) or national classification and IPC IPC⁸: H01B 3/30 (2006.01)		
Applicant INDUSTRIE UNIVERSITY COOPERATION FOUNDATION SOGANG UNIVERSITY		
<p>1. This international preliminary examination report has been prepared by this International Preliminary Examination Authority and is transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>3</u> sheets, including this cover sheet.</p> <p><input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).</p> <p>These annexes consist of a total of <u>2</u> sheets.</p> <p>3. This report contains indications relating to the following items:</p> <p>I. <input checked="" type="checkbox"/> Basis of the opinion</p> <p>II. <input type="checkbox"/> Priority</p> <p>III. <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p>IV. <input type="checkbox"/> Lack of unity of invention</p> <p>V. <input checked="" type="checkbox"/> Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p>VI. <input type="checkbox"/> Certain documents cited</p> <p>VII. <input type="checkbox"/> Certain defects in the international application</p> <p>VIII. <input type="checkbox"/> Certain observations on the international application</p>		
Date of submission of the demand 14 September 2005 (14.09.2005)	Date of completion of this report 9 May 2006 (09.05.2006)	
Name and mailing address of the IPEA/AT Austrian Patent Office Dresdner Straße 87 A-1200 Vienna Facsimile No. 1/53424/200	Authorized officer SCHLECHTER B. Telephone No. 1/53424/448	

Form PCT/IPEA/409 (cover sheet) (July 1998)

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/KR 2004/003287

I. Basis of the report

1. With regard to the elements of the international application:*

- ☐ the international application as originally filed
- ☒ the description:
pages 2-12, as originally filed
pages _____, filed with the demand
pages 1,13, filed with the letter of 14 September 2005 (14.09.2005).
- ☒ the claims:
pages 18-21, as originally filed
pages _____, as amended (together with any statement) under Article 19
pages _____, filed with the demand
pages _____, filed with the letter of _____.
- ☐ the drawings:
pages 2/2, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____.
- ☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____.

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in printed form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages _____.
- ☐ the claims, Nos. _____.
- ☐ the drawings, sheets/fig _____.

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as „originally filed“ and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/KR 2004/003287**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement			
Novelty (N)	Claims	1-10	YES
	Claims	----	NO
Inventive step (IS)	Claims	1-10	YES
	Claims	----	NO
Industrial applicability (IA)	Claims	1-10	YES
	Claims	----	NO

Citations and explanations (Rule 70.7)

The following documents are cited in the Search Report:

D1: US 2003055134 A1

D2: US2003065123 A1

D3: US 6632748 B

D4: KR 200324002 A

D1 and its family member D3 disclose a composition for preparing substances having nano-pores comprising cyclodextrin derivative; thermo-stable organic or inorganic matrix precursor; and solvent for dissolving both cyclodextrin derivative and the matrix precursor.

D2 and its family member D4 teach the preparation of a siloxane-based resin by hydrolyzing and polycondensing cyclic siloxane compound and cage-shaped siloxane compound, optionally with silane compound(s) substituted with hydrolyzable group(s) at silicon.

The subject matter of the present application is concerned with reactive nanoparticulate porogen based on cyclodextrin derivative to be used as a porogen, the derivate especially comprising C1-6 trialkoxysilane groups.

The cited documents disclose cyclodextrin derivative as porogen, however remain silent concerning C1-6 trialkoxysilane groups.

Thus, claims 1, 3, 4, 6 and 10 can be considered novel and inventive.

Residual claims 2, 5 and 7-9 are dependent on independent claims, respectively.

Industrial applicability is given.

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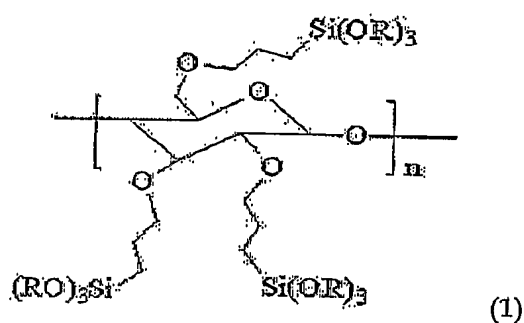
14 SEPTEMBER 2005

**REACTIVE CYCLODEXTRIN DERIVATIVES AS PORE-FORMING
TEMPLATES, AND LOW DIELECTRIC MATERIALS PREPARED BY USING
THE SAME**

5 Technical Field

This invention relates to reactive nanoparticular porogen based on cyclodextrin derivatives useful as a pore-forming template (porogen) and a low dielectric matrix, with excellent mechanical properties and uniformly distributed nanopores, manufactured by sol-gel reaction of the above reactive cyclodextrin derivatives themselves. Further, this invention also relates to an ultralow dielectric material with uniformly distributed nanopores, a relatively high porosity of 51% and a relatively low dielectric constant of 1.6, manufactured by blending of the conventional organic or inorganic silicate precursor by using the above reactive cyclodextrin as a porogen.

15 Background of Invention



In the above formula 1, R represents the same or different C₁₋₆ alkyl groups, respectively, wherein n is an integer of 6 to 12.

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Comparative Example 2

Low dielectric thin film was manufactured using cyclicsilsesquioxane (CSSQ), a low dielectric film manufactured by Samsung Advanced Institute of Technology (Korea) and also disclosed in Korea Laid-Open Patent Application No. 2002-75720, was used as matrix and heptakis(2,3,6-tri-*O*-methyl)- β -cyclodextrin (tCD) was used as a porogen. The experimental method and its physical properties of the comparative example 2 are cited from the above-mentioned Korean patent application.

Further, the physical properties of the thin films manufactured in example 1, comparative examples 1 and 2, respectively, were measured by the method described in the following experimental example, and the results are shown in Table 1, and Figs. 2 and 3, respectively.

Experimental Example: Measurement of Physical Properties of Thin Films

The refractive index and thickness of thin films were measured at 632.8 nm by using ellipsometer (L166C, Gaertner Scientific Corp.). The porosities of the thin films were calculated by using Lorentz-Lorentz equation, shown in the following equation 1.

Equation 1

$$\frac{(n_s^2 - 1)}{(n_s^2 + 1)} = (1 - p) \frac{(n_f^2 - 1)}{(n_f^2 + 1)}$$

In the above equation 1, n_s or n_f indicates porous or non-porous refractive indices, respectively and p indicates porosity.

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